Complete plasminogen activator inhibitor 1 deficiency

Complete plasminogen activator inhibitor 1 deficiency (complete PAI-1 deficiency) is a disorder that causes abnormal bleeding. In people with this disorder, bleeding associated with injury can be excessive and last longer than usual.

Individuals with complete PAI-1 deficiency may experience prolonged nosebleeds, excessive bleeding after medical or dental procedures, easy bruising, and significant bleeding into the joints or soft tissues after even a minor injury. Internal bleeding after an injury, especially bleeding around the brain (intracranial hemorrhage), can be life-threatening. Affected females may have excessive bleeding associated with menstruation (menorrhagia) and abnormal bleeding in pregnancy and childbirth.

In addition to bleeding problems, some people with complete PAI-1 deficiency develop scar tissue in the heart (cardiac fibrosis), which can lead to heart failure.

Frequency

Complete PAI-1 deficiency is a rare disorder; its prevalence is unknown. It has been well studied in a large family belonging to the Old Order Amish population of eastern and southern Indiana. Additional cases in North America, Europe, and Asia have been described in the medical literature.

Complete PAI-1 deficiency is inherited equally by both sexes, but tends to be diagnosed earlier and more frequently in females because of its effects on menstruation, pregnancy, and childbirth.

Causes

Complete PAI-1 deficiency is caused by mutations in the *SERPINE1* gene. This gene provides instructions for making a protein called plasminogen activator inhibitor 1 (PAI-1). PAI-1 is involved in normal blood clotting (hemostasis). After an injury, clots protect the body by sealing off damaged blood vessels and preventing further blood loss.

The PAI-1 protein blocks (inhibits) the action of other proteins called plasminogen activators. These proteins promote the dissolution of clots (fibrinolysis). By inhibiting plasminogen activators, the PAI-1 protein helps ensure that clots remain intact until they are no longer needed to stop bleeding.

The *SERPINE1* gene mutations that cause complete PAI-1 deficiency result in the production of a PAI-1 protein that is nonfunctional or that is unstable and quickly broken down. Absence of functional PAI-1 protein allows plasminogen activators to dissolve blood clots prematurely, resulting in the abnormal bleeding associated with this disorder.

Inheritance Pattern

This condition is inherited in an autosomal recessive pattern, which means both copies of the gene in each cell have mutations. The parents of an individual with an autosomal recessive condition each carry one copy of the mutated gene, but they typically do not show signs and symptoms of the condition.

Other Names for This Condition

- complete PAI-1 deficiency
- congenital plasminogen activator inhibitor type 1 deficiency
- homozygous PAI-1 deficiency
- hyperfibrinolysis due to PAI1 deficiency
- PAI-1 deficiency
- PAI-1D
- PAI1 deficiency
- plasminogen activator inhibitor type 1 deficiency
- plasminogen inhibitor-1 deficiency
- quantitative PAI-1 deficiency

Diagnosis & Management

Genetic Testing Information

- What is genetic testing?
  /primer/testing/genetictesting
- Genetic Testing Registry: Congenital plasminogen activator inhibitor type 1 deficiency
  https://www.ncbi.nlm.nih.gov/gtr/conditions/C2750067/

Other Diagnosis and Management Resources

- GeneReview: Complete Plasminogen Activator Inhibitor 1 Deficiency
  https://www.ncbi.nlm.nih.gov/books/NBK447152
- MedlinePlus Encyclopedia: Bleeding Time
  https://medlineplus.gov/ency/article/003656.htm

Additional Information & Resources

Health Information from MedlinePlus

- Encyclopedia: Bleeding Disorders
  https://medlineplus.gov/ency/article/001304.htm
- Encyclopedia: Bleeding Time
  https://medlineplus.gov/ency/article/003656.htm
- Health Topic: Bleeding Disorders
  https://medlineplus.gov/bleedingdisorders.html

Genetic and Rare Diseases Information Center

- Plasminogen activator inhibitor type 1 deficiency
  https://rarediseases.info.nih.gov/diseases/4381/plasminogen-activator-inhibitor-type-1-deficiency

Educational Resources

- American Society of Hematology: Bleeding Disorders
  https://www.hematology.org/education/patients/bleeding-disorders
- Centers for Disease Control and Prevention: Bleeding Disorders in Women
  https://www.cdc.gov/Features/BleedingDisorder/
- Orphanet: Congenital plasminogen activator inhibitor type 1 deficiency
  https://www.orpha.net/consor/cgi-bin/OC_Exp.php?Lng=EN&Expert=465
- Rare Coagulation Disorders Resource Room
  http://www.rarecoagulationdisorders.org/diseases/plasminogen-activator-inhibitor-type-1-deficiency/disease-overview-2
- WomensHealth.gov: Bleeding Disorders
  https://www.womenshealth.gov/a-z-topics/bleeding-disorders

Patient Support and Advocacy Resources

- Foundation for Women and Girls with Blood Disorders
  https://www.fwgbd.org/
- National Hemophilia Foundation
  https://www.hemophilia.org/

Clinical Information from GeneReviews

- Complete Plasminogen Activator Inhibitor 1 Deficiency
  https://www.ncbi.nlm.nih.gov/books/NBK447152

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28plasminogen+activator+inhibitor+1+deficiency%29+AND+english%5Bla%5D+AND+human%5Bmh%5D

Catalog of Genes and Diseases from OMIM

- PLASMINOGEN ACTIVATOR INHIBITOR-1 DEFICIENCY
  http://omim.org/entry/613329

Medical Genetics Database from MedGen

- Congenital plasminogen activator inhibitor type 1 deficiency
  https://www.ncbi.nlm.nih.gov/medgen/412870

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